

## IME 443 Machining and Machine Tools

**Designation:** Professional elective

**Catalog Data:** IME 443 Machining and Machine Tools (3) Machine tool motions, power requirements and machining times. Mechanics and economics of metal machining. Introduction to numerical control and computer aided programming of CNC machine tools. (Lec. 3) Prerequisites: 240 or 340 and CVE 220 or permission of instructor.

**Text Book:**

Boothroyd, G., and Knight, W.A., Boothroyd, G., and Knight, W.A., "Fundamentals of Machining and Machine Tools", 3<sup>rd</sup> Edition, CRC Press, 2005

**Prerequisites by Topics:**

1. Introduction to Materials Science
2. Introduction to Materials Processing

**Course Objectives:**

Students completing this course will have:

Objective	Link to Curriculum Objective
1. An understanding of the mechanics of machining processes and the relationship to material properties.	7, 8, 9
2. An understanding of the economics of machining processes and the influence on process selection.	7, 8, 9
3. Experience of the operation and programming of numerically controlled machine tools.	2, 4, 8, 9
4. Experience of undertaking an in-depth study of a selected aspect of machining, which is presented orally and in writing.	7, 14

**Topic Covered:**

1. Review of machine tools and determination of machining times (3 classes)
2. Mechanics of Metal Cutting (2 classes)
3. Forces & Power Consumption (2 classes)
4. Shear Angle Solutions (2 classes)
5. Friction in Metal Cutting (1 class)
6. Lubrication (1 class)
7. Surface Finish (1 class)
8. Tool Wear (2 classes)
9. Economics of cutting (3 classes)
10. Abrasive machining processes (4 classes)

- 11. Numerical Control (3 classes)
- 12. Design for Machining (2 classes)
- 13. Non-conventional machining processes (3 classes)
- 14. Tests (2 classes)
- 15. Final Project

**Contribution to Professional Component:**

Engineering Science: 1 credit or 33%  
 Engineering Design: 2 credits or 67%

**Course Outcomes:**

Departmental Outcome	Indicator
A. An ability to solve engineering problems by applying knowledge of mathematics and basic science.	Homework assignments, Tests, Overall grade
B. An ability to use modern computing tools and techniques to effectively solve industrial engineering problems	Numerical control assignments. Design for machining assignments
D. An ability to solve complex engineering problems that combine aspects of mechanics, materials, thermodynamics and electrical circuits.	Homework assignments, Tests, Overall grade
J. An understanding of common manufacturing processes and their applications.	Homework assignments, Tests, Overall grade
L. An in-depth knowledge in at least one area of interest related to industrial engineering.	Final grade
M. An ability to take an assigned engineering problem, analyze it and formulate and implement a solution.	Homework assignments, Tests
T. An ability to present engineering information clearly and succinctly in written form.	Final project report
U. An ability to make clear oral presentations.	Final project presentation

**Prepared by:** Winston Knight      **Date:** December 2005